DISCLAIMER: These Standard Operating Procedures (SOP's) are for the exclusive use of Navy Public Works Center (PWC) Norfolk. They are promulgated as guidance for their NAVFAC Commands. If intended to be used by other activities, they must be tailored to each activity's particular requirements and must be reviewed/approved by the activity's safety professionals prior to use.

NAVY PUBLIC WORKS CENTER
NORFOLK, VIRGINIA
UTILITIES DEPARTMENT

STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS

TITLE

INVESTIGATE NO POWER OR SINGLE PHASING CONDITION AT A FACILITY

PROCEDURE NUMBER

WC 622 HVE 024

SIGNED:_____

(DATE)

APPROVED:_____

(DATE)

SAFETY PROFESSIONAL:_____

(DATE)

MANAGEMENT OFFICIAL:_____

(DATE)

REVISION A

INVESTIGATE NO POWER OR SINGLE PHASING
CONDITION AT A FACILITY

DISTRIBUTION

CODE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE
601.C3							
620							
622							
610.E1							
622.1							

REVISIONS

REV	DESCRIPTION	SIGNATURE	DATE
A	Initial Issue.		

INVESTIGATE NO POWER OR SINGLE PHASING CONDITION AT A FACILITY

Purpose:
Procedure to check a no power or single phasing problem at a facility.

Potential Energy Sources:
1. 34.5/11.5/4.16 kv equipment and cables.
2. Facility 480Y277, 208Y120, 120/240, 240/480 equipment and wires.

Tools and PPE:
Tools: Multimeter, high voltage tester, shotgun stick, Meggar, TTR, and assorted hand tools. PPE: Nomex coveralls, Nomex hood, insulating rubber gloves, insulating rubber sleeves, hard hat, safety shoes, safety glasses. The class of rubber gloves and sleeves will depend on the exposure voltage as per the following: Class 0 - up to 1,000 volts, Class 1 - up to 7,500 volts, Class 2 - up to 17,000 volts, Class 3 - up to 26,500 volts, Class 4 - up to 36,000 volts.

References:
1. PWC Occupational Safety and Health Program Manual, PWCNORVAINST 5100.33E
2. Occupational Safety and Health Standards for General Industry 29 CFR PART 1910): Subpart I, Personnel Protective Equipment; Subpart R, Electrical Power Generation / Transmission / Distribution; Subpart S, Electrical
3. NFPA 70 E, Approach Distances To Exposed Energized Electrical Conductors and Circuit Parts
4. ANSI C2-1987, National Electrical Safety Code
5. Electrical Transmission and Distribution Safety Manual, NAVFAC P-1060
6. US Corps of Engineers Safety and Health Requirements Manual
7. PWC SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)
8. PWC SOP# 600 HVE 6, PWC Switching or Breaker Operation
9. SOP WC 622 HVE 007, Switchout And Switchback Energized Circuit

Procedures:
1. Assess conditions at facility’s transformer site. Wear Nomex coveralls, safety shoes, and hard hat while visually checking area.

2. The cause of the facility’s power problem can be located at various points. The cause can be associated with the facility’s high voltage equipment, transformer, or secondary gear. To determine what the problem is and where the problem possibly is, use a calibrated Multimeter to measure the facility’s secondary voltage at the transformer’s secondary bushings. If necessary remove all covers to gain access to the transformer’s bushings. Measure phase to phase and phase to neutral for all phases.

If the facility’s power voltage is less than 300 volts, maintain wearing the PPE per Step 1 and avoid contact with energized

components while measuring the voltage. If the facility's voltage is greater than 300 volts, wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, and insulating rubber gloves.

If clearances from energized parts are tight around the transformer's bushings such as in unit substations with secondary switchgear, wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, insulating rubber gloves, and insulating rubber sleeves while measuring the voltages.

Secondary Problem

3. If the voltage check made per Step 2 indicates the secondary voltage is acceptable at the point measured, then the facility's problem involves secondary equipment, wire, or connections. The investigating personnel should begin measuring voltages, checking devices, and checking connections from the point of measurement in Step 2 downstream till the problem's cause is found. The PPE will be the same as Step 2.

Possible Primary Circuit, Primary Switch, Transformer Problem

3. If the voltage check made per Step 2 indicates the secondary voltage is unacceptable at the point measured, then the facility's problem involves one of the following:
   a) high voltage circuit feeding the facility transformer
   b) transformer primary disconnect switch and cables associated with it
   c) transformer primary disconnect switch's fuses
   d) transformer

The investigators will have to determine what and where the problem is.

Wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, insulating rubber gloves, and insulating rubber sleeves for Steps 4-6.

4. Open the building transformer's primary switch as per SOP PWC SOP# 600 HVE 6, PWC Switching or Breaker Operation. Ensure that the facility's emergency generator, if present, is isolated and will not back feed to the transformer.

5. Remove the primary switch's fuses or fuse links. Visually check the fuses and fuse links for blown indication. Test fuses for continuity.

6. If all primary disconnect switch's fuses are good then test the primary voltage at the transformer primary disconnect switch's line side using a high voltage tester. Before the line side cables are checked, test the high voltage tester on

a known energized circuit to verify the tester is working. Test each cable separately, taking care not to cross phase during test. Upon completion of the test, recheck the high voltage tester to re-verify it is working properly.

If the primary switch will not allow access to the circuit conductors, then personnel will
a) go to another transformer site on the same primary circuit as the facility's transformer and check the secondary voltage there as per procedures and PPE of Step 2.
b) go to the substation the primary circuit originates from and check if the feeder breaker is still closed and what the breaker's ammeters indicate. Wear Nomex coveralls, safety shoes, and hard hat while in substation.

7. If a primary disconnect switch's fuse has blown, or if a primary disconnect switch's fuse has not blown and there is no problem with the primary circuit, an emergency shut down of the primary circuit will be performed per SOPs
a) WC 622 HVE 007, Switchout and Switchback Energized Circuit
b) WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)
Perform the following checks/tests, Steps 8-13.

Once the primary circuit has been deenergized and grounded per Step 7, then the PPE requirements are safety shoes and work gloves(if hand injury is possible).

8. Visually check the primary disconnect switch. Evaluate the following:
a) line side connections
b) load side connections
c) fuse holders
d) contacts
e) barrier boards
f) cables

9. Check the connections to the facility transformer's primary bushings.

10. If the transformer is a dry type, remove the enclosure panels and closely inspect the transformer for burn/flash areas and damaged connections. If the transformer is oil type then open the top access cover and check for obvious problems such as smoke, heat, and odor.

11. If no problem has been found up to this point, then isolate the transformer by disconnecting the primary and secondary conductors. Once the transformer has been isolated Meggar the transformer. Check phase to phase and each phase to

ground. Check primary and secondary windings. Refer to attached table for further information.

Personnel not involved with the Meggar test will stay clear of transformer. The testing personnel will wear Nomex coveralls, safety glasses, safety shoes, hard hat, and insulating rubber gloves.

12. If the Meggar results are acceptable then contact Code 610, Electrical Branch, to come to site and perform a TTR test.

13. If no problem has been found up to this point then
    a) replace any blown fuses of the primary disconnect switch
    b) close the disconnect switch per following SOPs PWC SOP WC 622 HVE 013, Hazardous Energy Control(Lockout,Tagout)PWC SOP# 600 HVE 6, PWC Switching or Breaker Operation
    c) reenergize the primary circuit per SOPs WC 622 HVE 007, Switchout and Switchback Energized Circuit WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)

14. If the circuit and/or primary disconnect switch fuses hold, then the investigation is over. If the circuit and/or primary disconnect switch fuses do not hold, then the investigation work will continue beginning at Step 7.

Problem Determined

15. When a problem has been found notify the appropriate repair work center. Inform the repair group what the problem is and where it is located at.

16. If any of the primary disconnect switch fuses have blown, obtain replacement(s) and, depending on what work may be required at the site, put the fuses back in the switch or leave on site for placement at a later time.

17. If WC 622 personnel complete the necessary repair work
    a) Restore all disconnected connections.
    b) Restore all covers and/or panels.
    c) Remove lock and tag from primary disconnect switch. Close the switch to reenergize the facility transformer. Follow the following SOPs PWC SOP WC 622 HVE 013, Hazardous Energy Control(Lockout,Tagout)
       PWC SOP# 600 HVE 6, PWC Switching or Breaker Operation
    d) If necessary, reenergize the primary circuit per SOPs WC 622 HVE 007, Switchout and Switchback Energized Circuit WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout).When performing step c and d, wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, insulating rubber gloves, and insulating rubber sleeves.

END

INVESTIGATE NO POWER OR SINGLE PHASING
CONDITION AT A FACILITY